



Providing sustainable energy solutions worldwide

Installation- and maintenance instruction

BG 450

J/K

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1. General Information

This Installation and Maintenance manual:

- is to be regarded as part of the burner and must always be kept near the installation site
- is intended for use by authorised personnel
- must be read prior to installation
- must be observed by all who work with the burner and associated system components
- work with the burner may only be carried out by certified installers/ personnel

Enertech AB is not liable for any typographical errors and reserves the right to make design changes without prior notice.

Safety instructions

- The burner may only be used for its intended purpose in accordance with the product's technical data.
- The burner may only be installed and operated by authorised personnel.
- The product is packaged to prevent damage from occurring during handling. Handle the product with care. Lifting equipment must be used to lift larger packages.
- The products must be transported/stored on a level surface in a dry environment, max. 80% relative humidity, no condensation. Temperature -20 to +60 °C.
- Check that the burner is compatible with the boiler's output range.
- All components must be installed without being bent, twisted or subjected to mechanical or thermal forces which can affect the components.
- The burner must be installed so that it complies with local regulations for fire safety, electrical safety, and fuel distribution.
- The gas outlet from the pressure regulator shall be configured in accordance with applicable regulations and lead to a safe area.
- Make sure when installing the equipment that there is enough space to service the burner.
- Permitted temperature during operation -10 to +60 °C. Max 80% relative humidity, no condensation.
- The installer must ensure that the room has adequate air supply.
- The room must comply with local regulations pertaining to its intended use.
- The installation site must be free of chemicals.
- Burner pipes, fan wheels and air dampers may contain sharp edges.
- The surface temperature of the burner's components can exceed 60 °C.
- Caution: The burner has moving parts, and there is risk of crushing injuries.



- The electrical installation must be professionally carried out in accordance with applicable high voltage regulations, as per Enertech's recommendations.
- Before servicing, shut off the fuel supply and turn off the power to the burner.
- Seal inspections must be performed during installation and servicing to prevent gas leakage.
- Care should be taken by the installer to ensure that no electrical cables or fuel lines are crushed or otherwise damaged during installation or servicing.
- If the boiler is equipped with an access hatch, this must be equipped with a hatch opening switch connected to the burner's safety system.
- When in operation, the burner's noise level can exceed 85 dBA. Use hearing protection.
- The burner must not be put into operation without proper safety and protection devices.
- A Class BE fire extinguisher is recommended.
- It is forbidden to alter the design or use accessories which have not been approved by Enertech in writing.
- Prior to operation, the following points must be checked:
 - fitting and installation work has been completed and approved
 - electrical installation has been correctly performed
 - flue gas ducts and combustion air ducts are not blocked
 - all actuators and control and safety devices are in working order and correctly set



Actions to take if you smell gas

Turn off the equipment and the boiler. Open windows and doors. Prevent open flames or sparking, e.g. do not turn lights on or off, do not use any electrical appliances, do not use mobile phones. Open windows and doors. Close the gas ball valve. Warn residents; do not use doorbells. Evacuate the building. Notify the installer or gas supplier once the building has been evacuated.

Burner servicing schedule

Servicing must be carried out once a year or after 3000 hours of operation

Burner	1 year	3000 hrs
Inspection of electrical installation	1 year	3000 hrs
Leakage check	1 year	3000 hrs
Filter	1 year replacement at $\Delta p > 10$ mbar	3000 hrs replacement at $\Delta p > 10$ mbar
Electrodes	Replacement/Cleaning 1 year	Replacement/Cleaning 3000 hrs
Brake disc	Replacement/Cleaning 1 year	Replacement/Cleaning 3000 hrs
Motor	1 year	3000 hrs
Fan wheel	1 Year Replacement when cleaning needed/ imbalance	3000 h Replacement when cleaning needed/ imbalance

Component replacement intervals

Control system	10 years	250,000 starts
Valve control system	10 years	250,000 starts
Pressure switch	10 years	250,000 starts
Ignition system with flame guard	10 years	250,000 starts
UV flame sensor	10000 hrs	N/A
Gas pressure regulators	15 years	N/A
Gas valve without seal testing	10 years	250,000 starts
Gas valve with seal testing	Replacement upon fault detection	N/A
Gas pressure switch	10 years	250,000 starts
Safety blow-off system	10 years	N/A
Damper motor	N/A	500,000 starts
Contactors	10 years	500,000 starts



The burner and its components must be recycled according to applicable regulations.

Delivery check

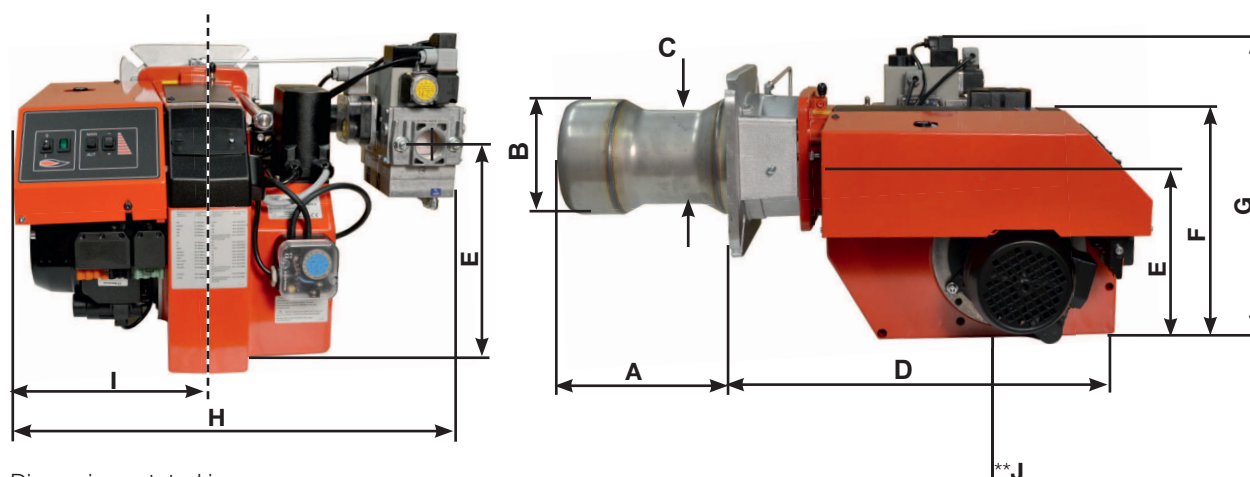
- Make sure everything is delivered and the goods have not been damaged during transit.
- If something is wrong with a delivery, report it to the supplier.
- Transport damage must be reported to the shipping company.

2. Technical data

2.1 Burners are intended for use at:

- Water heating generators
- Steam generators
- Industrial applications
- Hot air generators

2.2 Dimensions



Dimensions stated in mm

Type		Length of burner tube	Flange measure A	Burner tube measure B	Burner tube measure C
BG 450	1	256	226	ø160	ø162
	2	356	326	ø160	ø162
	3	456	426	ø160	ø162

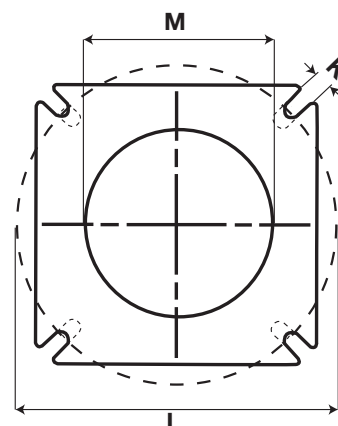
	D	E	F	G	H	I	**J
BG 450	538	252	328	*500	*640	262	200

2.2.1 Heat generator connection dimensions

	K	L	M
BG 450	M12	(Ø 210) Ø 255-290	Ø 170

* The above dimensions are max. measurements. Depending on the components used, the measurements may vary.

** Min. recommended distance to floor.



2.2.2 Capacity range

Capacity kW	Gas quantity at min. power Nm³/h ')	Gas quantity at max. power Nm³/h ')	Max. connection pressure mbar	Min connection pressure mbar
BG450				see data plate
G20 120-550	12	55	360	
G25 120-550	15	69	360	
G30 120-550	5	21	360	
G31 120-550	4	16	360	

Lower heat value Hu at normal state 15°C and 1013.25 mbar EN676				
Grade of gas		kWh/Nm³	MJ/Nm³	kcal/Nm³
Natural gas	G20	9.5	34.02	8126
Natural gas	G25	8.2	29.25	6986
Propane	G30	32.5	116.09	27728
Butane	G31	24.6	88.00	21019

Gas quantity and capacity vary according to grade of gas and connection pressure.

2.2.3 Appliance categories

Only dry gas is permitted for use

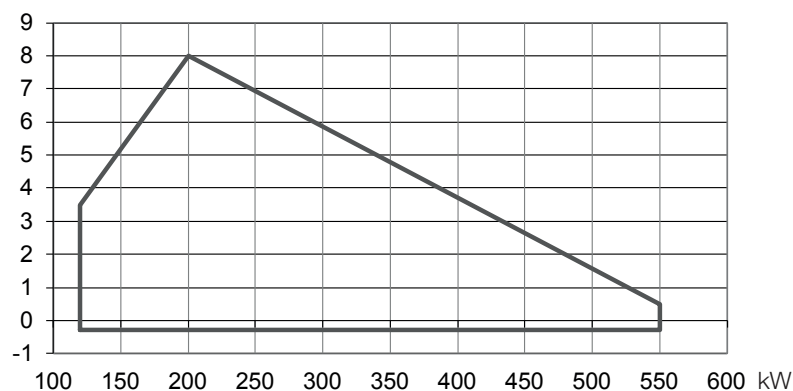
Geräte Kategorien Appliance categories	Versorgungsdrücke Supply pressures	Bestimmungsländer Countries of destination
II _{2R/3R}	20-360mBar	BG, CZ, DE, EE, ES, FR, GR, HU, IS, IT, LU, LV, NO, PT, SI, All countries
II _{2H3B/P}	20-360mBar	AT, CH, CY, DK, FI, LT, RO, SE, SK
II _{2H3P}	20-360mBar	GB, IE,
II _{2L3B/P}	20-360mBar	NL, RO
II _{2E3B/P}	20-360mBar	PL
I _{2E(R)B}	20-360mBar	BE
I _{3P}	20-360mBar	BE

2.2.4 Working field

BG 450

120-550 kW

Mbar



! Do not exceed working field

2.2.5 Electric Specification

Burner correspond to IP20

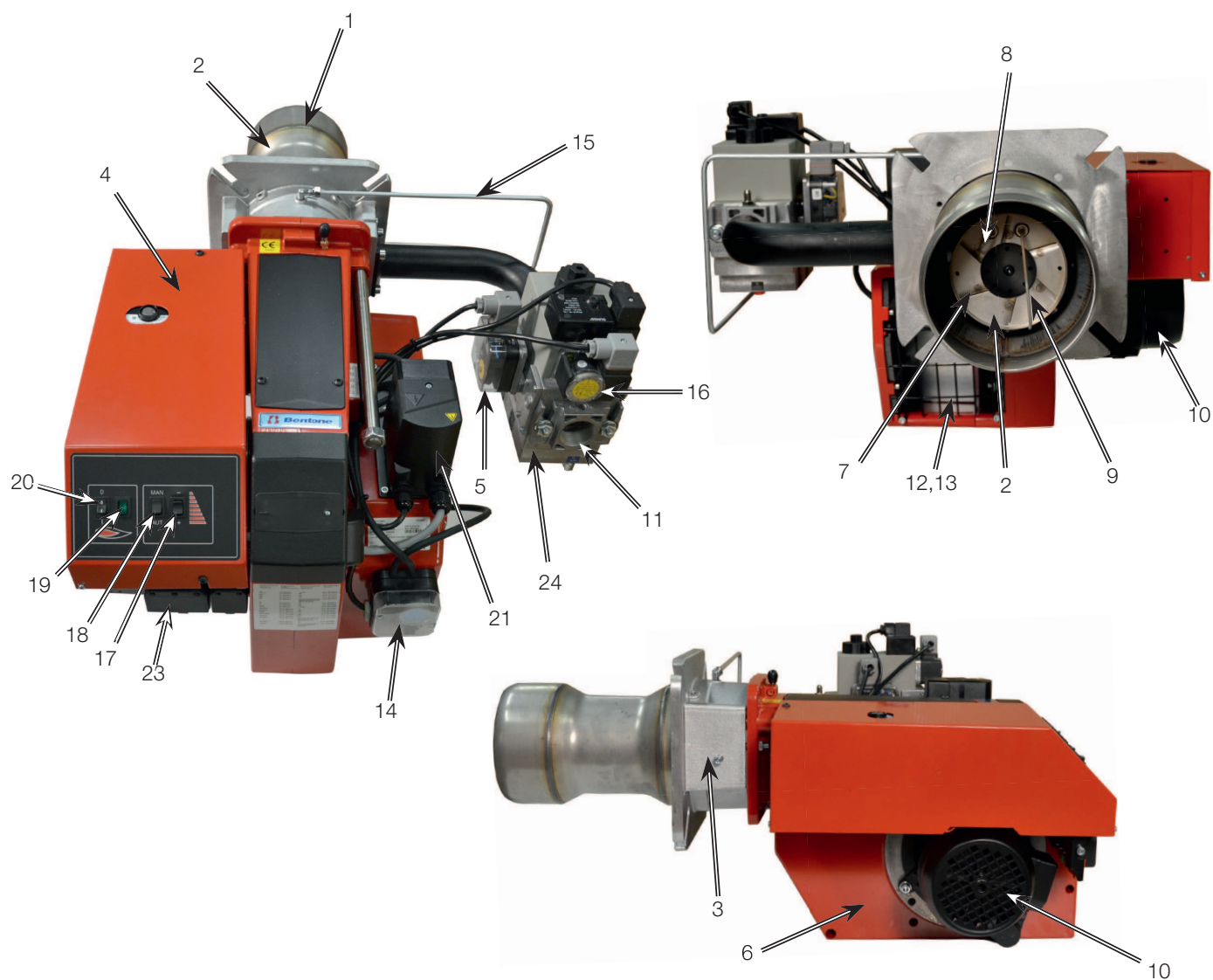
Type	BG 450
Motor	450W 230V 3,3A 50Hz
The recommended main fuse motor	C10A
Fitting	Natargas, Propan, Butan 1 ½"-2"
Control power	230V 3,3A 50Hz
Sound	89 dBA ± 0,5 dBA

Measurements according to EN 3746: 2010

Alt.1 The sound level of the burner can be reduced by equipping the burner with silencer. Installation must be done so it does not prevent air supply to the burner.

Alt.2 The burner's noise level can be reduced by connecting the burner's air intake to the air duct that opens into an appropriate location. Installation must be done so it does not prevent air supply to the burner.

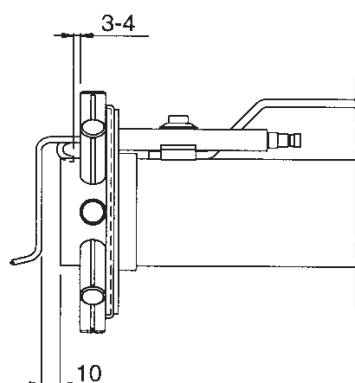
2.3 Description BG 450



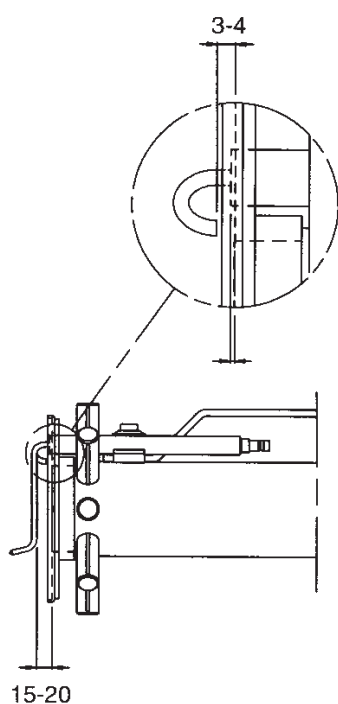
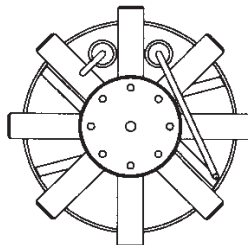
Components

- | | | |
|-----------------------------|--|---------------------------|
| 1. Burner tube | 12. Air intake | 21. Damper motor |
| 2. Nozzle assembly | 13. Air damper | 22. Relay box |
| 3. Connection flange | 14. Air pressure switch | 23. Electrical connection |
| 4. Electrical panel | 15. Impulse pipe | 24. MultiBloc |
| 5. Max. gas pressure switch | 16. Gas pressure switch | |
| 6. Fan housing | 17. Changeover switch, increase-decrease | |
| 7. Brake plate | 18. Changeover switch, manual-automatic | |
| 8. Ignition electrode | 19. Indicator lamp, operation | |
| 9. Ionisation electrode | 20. Switch 0-1 | |
| 10. Motor | | |
| 11. Gas connection | | |

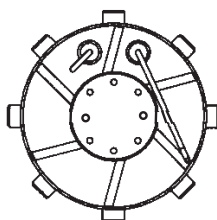
2.4 Gas nozzle



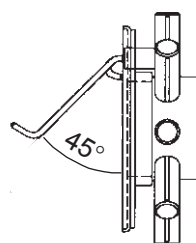
Towngas



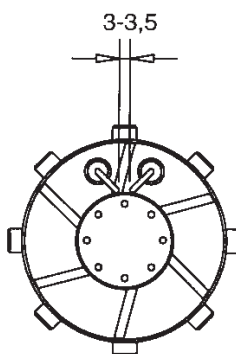
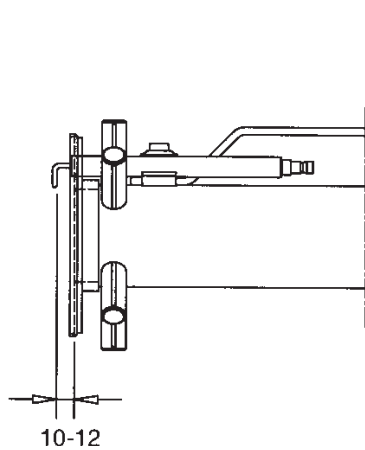
Natural gas



Propan



Biogas (UV detector)



3. General instructions

3.1 General instructions

The installation of the gas burner must be carried out in accordance with current regulations and standards. The installers of gas burners should therefore be acquainted with all regulations and ensure that the installation complies with the requirements. The installation, mounting and adjustment should be made with the greatest care and only the correct gas should be used.

3.2 Operating instructions

The operating instructions accompanying the burner should be left in a prominent position in the boiler room.

3.3 Instructions

The user should be thoroughly instructed in the function of the gas burner and the whole installation. The supplier must instruct the user.

3.4 Inspection and maintenance

See service schedule.

3.5 Start up

After the burner has been fitted to the boiler and the electric connection, the leakage control, the venting and the electric function test have been carried out, the burner will be ready for start-up.

However, study the sections dealing with adjustments of multi-bloc, combustion air and combustion head. Open the ball valve and switch on the main switch. If the burner starts the actual adjustment can be made.

3.6 Commissioning of installation

Control of the combustion. The combustion quality is checked by means of a flue gas analysis device. Adjust the burner to appr. 20%

excess air in accordance with the table. Check the flue gas temperature. Calculate the efficiency. Check also the actual gas volume on the gas meter so that the correct input is achieved.

4. Installation

4.1 Delivery check

Check that all has been delivered and that the goods have not been damaged during transport. If that is not the case, please notify the delivery company. Transport damages should be reported to the forwarding agency.

4.2 Preparations for installation

Check that the measurements and capacity range of the burner are compatible with the boiler. The power ratings on the type plate refer to the min. and max. power of the burner.

4.3 Gas supply

For good operating safety, it is important that the gas supply system is installed correctly.

Consider the following:

1. Check that the burner is approved for the gas quality of the installation. If not, please contact the supplier.
2. Check that the gas components of the burner are approved for indicated gas pressure.
3. The gas supply system should be installed in accordance with current standards.
4. Pipe lines should be run so that service on boiler and burner is facilitated.
5. Pipe lines should be run so that eventual contaminants cannot come into contact with the gas components.
6. Gas discharge system must be installed prior to local regulations.

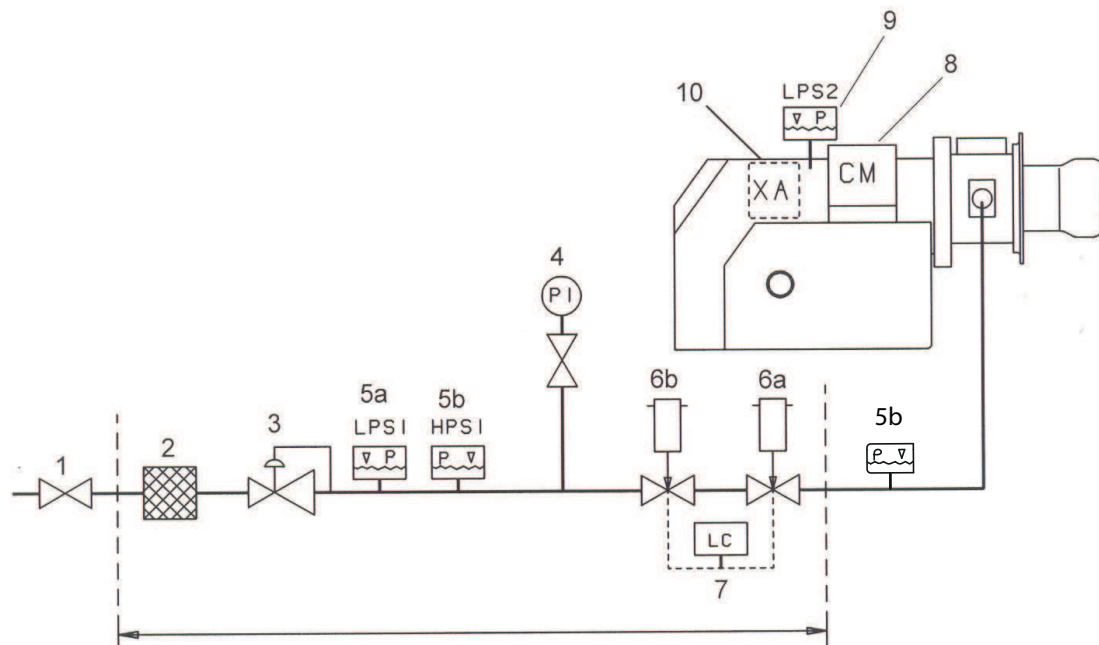
4.4 Electric connection

Before starting the electric installation, the main switch must be turned off. If the boiler has a 7-pole and a 4-pole Eurostecker connector, these usually fit directly to the burner. If not, use the connectors included.
(Refer to connection under Electric equipment)



If an electric connection other than the one recommended by Enertech is used, a risk of damage and injury can arise.

4.5 Skeleton diagrams



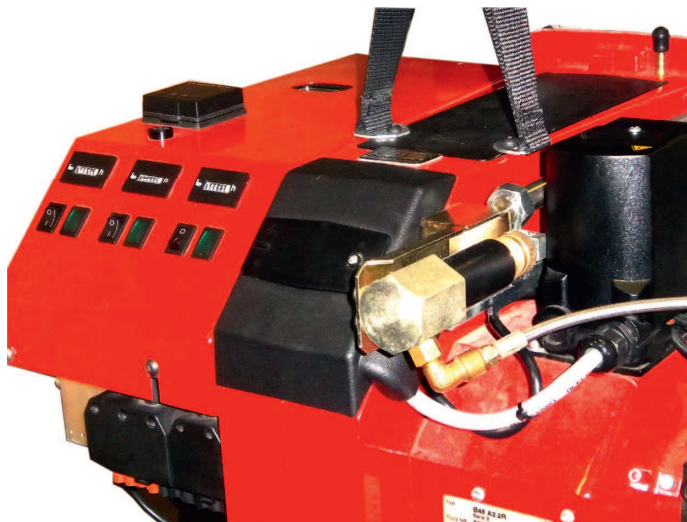
1. Ball valve
2. Filter
3. Governor
4. Pressure gauge with shut-off cock
- 5a. Gas pressure switch, mini
- 5b. Gas pressure switch, maxi (option)
- 6a. Main valve, 2 -stage
- 6b. Safety valve
7. ¹⁾ Valve proving system
8. Air damper motor
9. Air pressure switch
10. Gas burner control LMV
11. Vent line to discharge gas

Pos. 5b, 7: Components not required according to EN 676.

¹⁾ Required over 1200 kW according to EN 676

4.6 Handling and lifting instruction

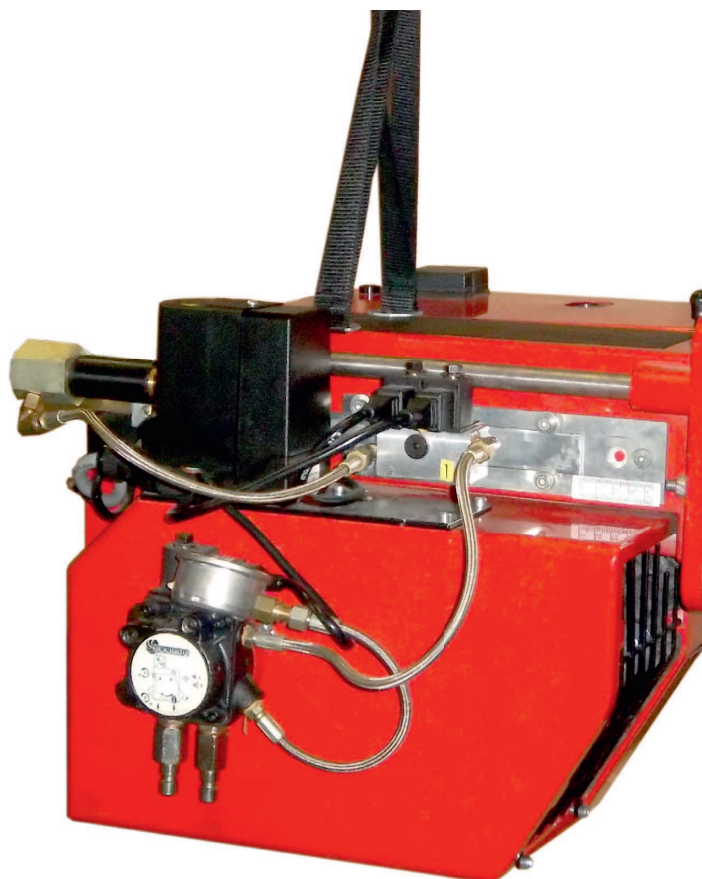
4.6.1 BG 450



Option
The lifting aid we used
here are available as
spare parts, Figure 1



Figure 1



4.7 Fitting the burner to the boiler

Mount the burner to the boiler using 4 bolts. See technical data for the hole pattern.

To make the fitting process easier, it is possible to separate the burner body from the gas flange with the combustion head and valve assembly in place.

Proceed as follows:

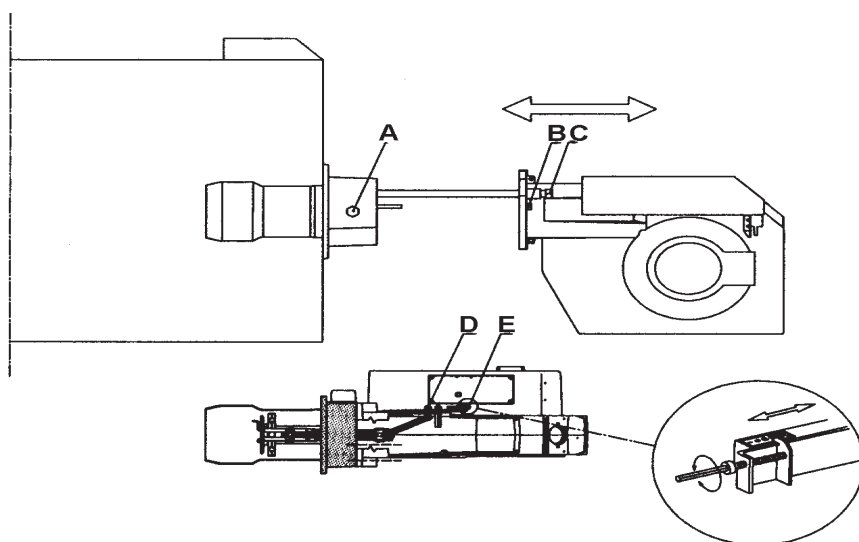
1. Ensure that no power is going to the burner. Break the main current and disconnect the Euro plugs from the burner. NB: If the burner is directly connected, ensure that all components on the burner are without power.
2. Remove the cover plate from the fan housing.
3. Loosen screw D on the nozzle assembly.
4. Disconnect the electrical cables to the valve assembly and gas damper motor.
5. Undo the screws (B) on both sides.
6. Undo the end stops (C) on the guides.
7. Disconnect the ignition cable, ionisation cable, and control arm from the gas nozzle.
8. Pull out the burner body from the guides and put it in a suitable place.

After separating the burner body and the gas flange, it is easier to mount the gas flange with the burner head and valve assembly to the boiler (loosen the valve assembly if required). Once the gas flange is fitted to the boiler, it is easy to lift the burner body up onto the guides. Assemble the burner in reverse order to its disassembly.



Check the gas tightness.

Service position



4.8 Inspection of gas nozzle before commissioning

The gas nozzle can easily be inspected by using the guides on the burner.

Proceed as follows:

1. Ensure that no power is going to the burner. Switch off the main power supply and disconnect the Euro plugs from the burner.



If the burner is directly connected, ensure that all components on the burner are without power.

2. Remove the cover plate from the fan housing.
3. Undo the nut (D) to the nozzle assembly.
4. Disconnect the ignition cable and ionisation cable for the gas nozzle.
5. Ensure there is enough slack in the electrical cables to the valve assembly and gas damper motor to pull out the burner body in the rear position on the guides. If there is not enough slack the cables can be disconnected.
6. Undo the screw (B) on both sides.
7. Pull out the burner on the guides.
8. Undo the screw(s) (A) on the gas flange.
9. Take out the gas nozzle.
10. See section Gas nozzle

Re-assemble the burner in reverse order to that described above. When re-assembling, make sure that the O-ring located between the gas nozzle and the gas flange is in the correct position when the nozzle is re-fitted.

5. Setting the burner

5.1 Setting the combustion assembly

It may sometimes be necessary to adjust the combustion assembly, i.e. the position of the brake plate in the burner tube.

5.1.1 Setting the combustion assembly,

- 5.1.2 The burner is equipped with a lever that changes the position of the brake plate in the combustion head. This is used to set the correct pressure drop across the combustion assembly and thereby obtain good combustion without ripples. Make the adjustment by turning screw X.

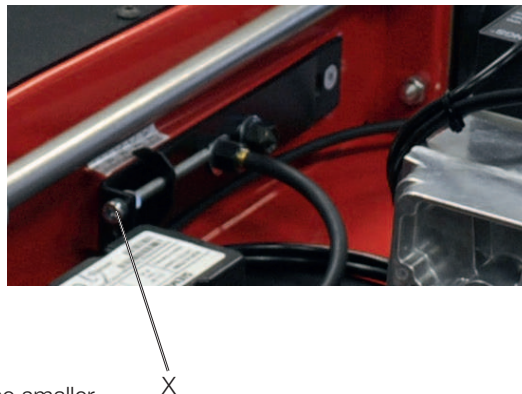
The best position is, among other things, dependent on the input power and overpressure in the boiler.

A general rule of thumb is that the smaller the capacity, the smaller the gap should be between the brake plate and the combustion assembly.

The position of the brake plate also has an impact on the quantity of air supplied for combustion. This means that once the brake plate has been adjusted, the combustion should be checked and, if necessary, the setting of the air damper adjusted to obtain good combustion.

A left turn opens the brake plate, providing a lower pressure drop and more air to the combustion process.

A right turn closes the brake plate, providing a higher pressure drop and less air to the combustion process.



5.2 Adjustment of gas flow (air damper)

5.2.1 Damper motor, air volume

- Adjust the orange cam for min. load (about 5-10 on scale).
- Adjust the red cam for max. load (90°).
- The blue cam is factory set for closed position during standstill.
- The black cam has no function at modulating operation.

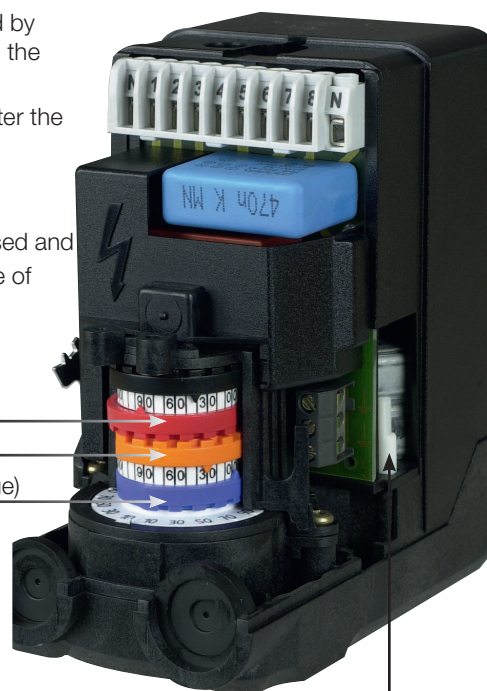
5.3 Adjustment of gas flow

- Before the burner starts vent the lines to make sure that there is gas available at the multibloc
- Use an allen key size 2,5 mm for adjusting N and V.
- Connect a pressure gauge for measuring PBr, (advisable to find out if the valves are open)
- Set the switch in position MAN.
- Set the gas pressure switch min. and air pressure switch on min. adjustment. Set the gas pressure switch max, if any, on max. adjustment.
- Start the burner, observe the pressure gauge, if no flame is established and the pressure gauge needle does not flicker, increase N. When the flame is established adjust the gas flow by means of the screw N. Use a flue gas instrument.
- Change over to max. load, press the switch "increase"
- Adjust the gas flow with V and check at the same time the combustion values.
- Go back to min. load and check the combustion value. Adjust if necessary.
- If necessary repeat the controls of the adjustment made on min. (N) and max. load(V).
- The desired gas flow on min. and max. has now been adjusted by changing the orange and the red cams. Check the gas flow on the gas meter available on the installation.
- Note! Do not forget to set the air and gas pressure switches after the adjustment, see special instructions

Releasing button:

By pressing the button and snapping it down, the motor will be released and the damper can easily be turned. This function facilitates an exchange of damper motor.

Max. load (red)
Min. load (orange)
Closed damper (blue)



Releasing button N.B.
The upper position is the standard position



Blå nock är gränsläge för helt stängt spjäll och behöver normalt ej ändras.

5.3.1 Calculate prepurge time:

V =	Fire box size	m ³
Q =	Burner output at prepurge	[kW]
X =	Prepurge time seconds	Water boilers 100% air rate at least 20s prepurge time 50% air rate at least 40s prepurge time 33% air rate at least 60s prepurge time
X =	Prepurge time seconds	Steam generators at last prepurge 5 times firebox volume
X =	Prepurge time seconds	Industrial heating process at least prepurge at least 5 times firebox and adapted compartments volumes together
Local regulations must be followed		

Calculation example:

Example A: V=2m³ Q=200

Example B: V=9,5m³ Q=500

Example C: V=25m³ Q=2200

$$\begin{aligned}
 \text{Example A} \quad X &= \frac{V \cdot 5}{((Q \cdot 1,2) / 3600)} = \frac{2 \cdot 5}{((200 \cdot 1,2)/3600)} = 150 \text{ seconds} \\
 \text{Example B} \quad X &= \frac{V \cdot 5}{((Q \cdot 1,2) / 3600)} = \frac{9,5 \cdot 5}{((500 \cdot 1,2)/3600)} = 285 \text{ seconds} \\
 \text{Example C} \quad X &= \frac{V \cdot 5}{((Q \cdot 1,2) / 3600)} = \frac{25 \cdot 5}{((2200 \cdot 1,2)/3600)} = 170 \text{ seconds}
 \end{aligned}$$

5.4 Recommended excess air when using default setting

Grade of gas	Excess air flue gases		Max. % CO ₂
	% O ₂	% CO ₂ Lambda 1.2	
Natural gas	3–5	≈10	11.9
Propane	3–5	≈11.5	13.9
Butane	3–5	≈11,5	14,1
Liquefied petroleum gas (LPG)	3–5	≈11	13,8

5.5 Determining the gas quantity for the system

The heat values indicated are normal values; the heat value varies according to the origin of the gas. For more exact information on values, contact the gas distributor.

Lower heat value Hu at normal state 15°C and 1013.25 mbar EN676				
Grade of gas		kWh/Nm ³	MJ/Nm ³	kcal/Nm ³
Natural gas	G20	9.5	34.02	8126
Natural gas	G25	8.2	29.25	6986
Propane	G31	24.6	88.00	21019
Butane	G30	32.5	116.09	27728

5.5.1 Example of how to calculate the gas quantity (natural gas G20):

$V_0 =$	Desired quantity of gas	[Nm ³ /h]
$Q =$	Boiler output	[kW]
$H_u =$	Gas heat value	[kWh/Nm ³] or [MJ/Nm ³] or [kcal/Nm ³]
$\eta =$	Boiler efficiency	[%]

Calculation example:

$Q =$ 160 kW

$H_u =$ Example A: 34020 MJ/Nm³

Example B: 9.5 kWh/Nm³

Example C: 8126 kcal/Nm³

$\eta =$ 90%

$$\begin{aligned}
 \text{Example A} \quad V_{0A} &= \frac{Q \cdot 3600}{H_u \cdot \eta} = \frac{160 \cdot 3600}{34020 \cdot 0.90} \approx 18.8 \text{ Nm}^3/\text{h} \\
 \text{Example B} \quad V_{0B} &= \frac{Q}{H_u \cdot \eta} \approx \frac{160}{9.5 \cdot 0.90} \approx 19 \text{ Nm}^3/\text{h} \\
 \text{Example C} \quad V_{0C} &= \frac{Q}{H_u \cdot 0.00116 \cdot \eta} = \frac{160}{8126 \cdot 0.00116 \cdot 0.90} \approx 19 \text{ Nm}^3/\text{h}
 \end{aligned}$$

If the barometer reading (altitude), pressure and temperature of the gas deviate significantly from normal values, this must be taken into account as follows:

$T =$	Temperature of gas at the gas meter	[°C]
$B =$	Barometer reading	[mbar]
$P =$	Pressure of gas at the gas meter	[mbar]
$f =$	Factor calculated for multiplication with flow in Nm ³ /h to arrive at actual flow in m ³ /h.	
$V =$	Actual flow	[m ³ /h]

$$f = \frac{273}{273+T} \cdot \frac{B+P}{1013.25}$$

Calculation example:

$$T = 15^{\circ}\text{C}$$

$$B = 945 \text{ mbar}$$

$$P = 15 \text{ mbar}$$

$$f = \frac{273}{273+15} \cdot \frac{945+15}{1013.25} \approx 0.90 \text{ Nm}^3/\text{h}$$

This means that the quantity of gas read from the gas meter should actually be read off as 1.11 . the calculated flow in a normal state.

$$\begin{aligned} V &= V_0 \cdot f \\ V_A &= V_{0A} \cdot f = 18.8 \cdot 0.90 \approx 17 \text{ m}^3/\text{h} \\ V_B &= V_{0B} \cdot f = 19 \cdot 0.90 \approx 17 \text{ m}^3/\text{h} \\ V_C &= V_{0C} \cdot f = 19 \cdot 0.90 \approx 17 \text{ m}^3/\text{h} \end{aligned}$$

5.6 Calculating the quantity of gas supplied

The quantity of gas supplied can be calculated if the system is equipped with a gas flow meter of some type. The procedure here is usually to measure how long it takes for the burner to consume a certain quantity of gas.

To measure:

t = Time for a certain quantity of gas consumed by the burner. [h]

M = Quantity of gas consumed. [m³]

V = Actual gas flow [m³/h]

$$V = \frac{M}{t} \text{ [m}^3/\text{h]}$$

Calculation example:

$$t = 1 \text{ min } 10 \text{ s}$$

$$M = 330 \text{ dm}^3 \text{ (litre)}$$

$$\begin{aligned} M &= \frac{330}{1000} = 0.33 \text{ m}^3 \\ t &= \frac{1}{60} + \frac{10}{3600} = 0.0194 \text{ h} \\ V &= \frac{M}{t} = \frac{0.33}{0.0194} \approx 17 \text{ m}^3/\text{h} \end{aligned}$$

5.7 Setting the air pressure switch

The air pressure switch should block the burner if the air quantity supplied for combustion is insufficient. The air pressure switch must be set so that, if there is a defective air supply at the burner's max. or min. capacity, it reacts before the monitored pressure falls so much that it results in poor combustion.

Inställningsområde ca:

LGW 10	1-10	mbar
LGW 50	2,5-50	mbar

Setting for air pressure switch

1. Remove the protective cover, screw (Y).



Be careful when adjusting the air pressure switch; it contains a live component.

2. Start the burner.
3. Carefully turn the scale on the air pressure switch clockwise until the air pressure switch stops the burner. **Is the tolerance on the scale for the min. air pressure switch approx. $\pm 15\%$?**
4. Try to find the pressure at which the burner stops for both the minimum and maximum input power by turning the scale. Make a note of the values and then set the air pressure switch on the basis of the highest pressure noted at which the burner stopped.
5. The air pressure switch should be set to a pressure approx. 10–15% lower than the highest noted pressure at which the burner stopped.
6. After setting the air pressure switch, perform repeated starts and run through the burner's set output range several times. This is to ensure the reliable function of the burner. If breakdowns or interruptions occur, the air pressure switch is probably set to a too narrow position.
7. Fit the protective cover, screw (Y).



5.8 Setting the min. gas pressure switch

The min. gas pressure switch should react to a burner connection pressure that is too low and in such cases prevent the burner from starting. If the connection pressure to the burner is too low during operation, the min. gas pressure switch should stop the burner. The burner can start again once the connection pressure has risen above the pressure set for the min. gas pressure switch.

Setting for min. gas pressure switch

1. Remove the protective cover, screw (Y).
2. Open the pressure outlet (X) and connect a manometer to measure the connection pressure.
3. Start the burner.
4. Measure and make a note of the connection pressure to the burner during normal operation at the highest input power.
5. Based on the desired connection pressure set, determine the connection pressure at which the gas pressure switch should stop the burner. Set the connection pressure at which the burner is stopped at a level where the burner is stopped before poor combustion occurs.
6. Set the min. gas pressure switch to this value by turning the scale.
7. Check the setting by carefully closing the ball valve while measuring the connection pressure.
8. When the min. gas pressure switch stops the burner, the value measured should then approximately correspond to the setting on the min. gas pressure switch. The tolerance on the scale for the min. gas pressure switch is approx. $\pm 15\%$.
9. Open the ball valve.
10. Remove the pressure gauge and close the pressure outlet (X).



Check the gas tightness.

11. Fit the protective cover, screw (Y).



5.9 Setting the power monitor

For burners equipped with power monitors. The power monitor blocks the burner if gas pressure in the connection pipe between the multi-block and burner becomes too high. The power monitor is connected to allow the burner to operate when blocked, see S10 in the wiring diagram.

Setting the power monitor

1. Remove the protective cover, screw (Y)
2. Open the test socket (X) and connect a pressure gauge to measure pressure in the connection pipe.
3. Start the burner
4. Measure and note the value
5. Using the measured pressure, the power monitor can be adjusted so that the burner can be stopped and its output can be limited.
6. Adjust the power monitor by tuning the adjuster knob until the desired value is reached. Test run the burner in the set power range.
7. Remove the pressure gauge and close the test socket.
8. Fit the cover on the power monitor and tighten the screw (Y).



Check the gas tightness.

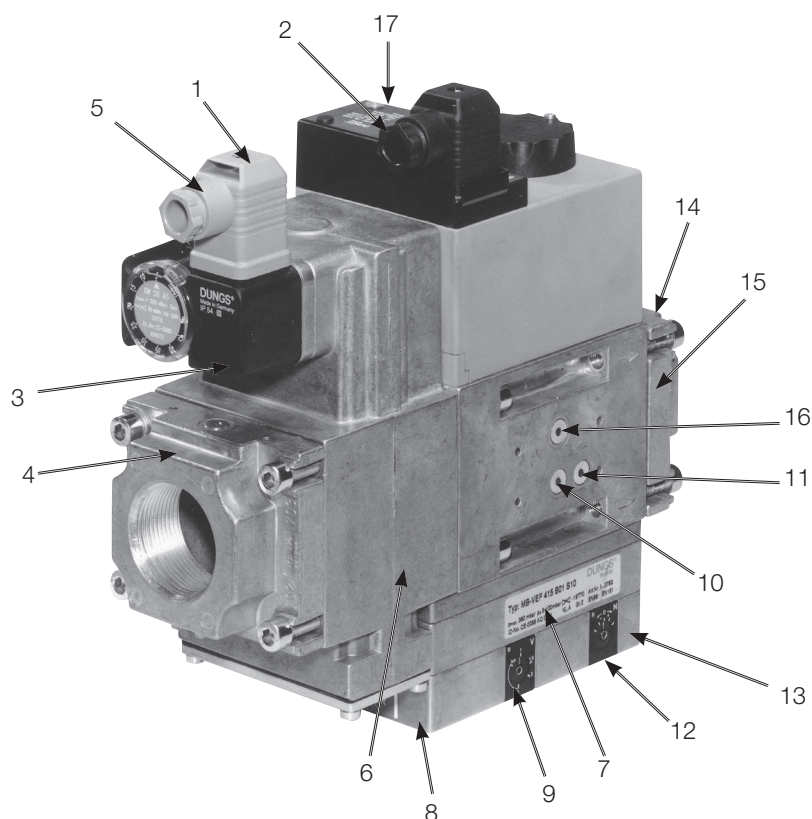


Setting range:

2.5–50	mbar	ÜB	50
5–150	mbar	ÜB	150

5.10 MB-VEF BO1, 415 - 425

! All components must be installed without being bent, twisted or subjected to mechanical or thermal forces which can affect the components.



It is possible to connect a leakage control VPS 504 and a gas pressure switch maxi.

- | | |
|--|--|
| 1. Electrical connection gas pressure switch mini | 11. Connection for measurement of burner pressure after V2 |
| 2. Electrical connection gas valve | 12. Adjustment screw for zero point adjustment N (min. load) |
| 3. Pressure switch mini | 13. Test point connection 1/8" PF |
| 4. Flange connection inlet | 14. Test point connection 1/8" PBr(after V2 burner) |
| 5. Test point connection 1/8" before V1 | 15. Flange connection, outlet |
| 6. Filter (on Multi-Bloc 425 external filter) | 16. Test point connection 1/8" Pa before V2 (after governor) |
| 7. Data plate | 17. Indication of V1 and V2 in operation (not standard) |
| 8. Connection 1/8" PL | |
| 9. Adjustment screw V for ratio PBr: PL (max. load) | |
| 10. Test point connection 1/8" before V1 (before governor) | |

- Max inlet pressure 360 mbar
- Valves V1+V2 class A group 2 in accordance with EN 161
- Governor class A group 2 in accordance with EN88
- Ratio $V P_{Br}:P_L$ 0,75:1-3:1
- Filter according to DIN 3386
- Ambient temperature -15°C- +70°C
- Protection standard type IP54 (according to IEC 529, DIN 40050)
- Gas family 1 +2 +3
- Outlet pressure 0,5 - 100 mbar
- Zero point adjustment $N \pm 2$ mbar
- Pressure switch DIN3398 T1
- Fan pressure P_L 0,4-100 mbar
- Fire room pressure P_F -2 -+5mbar
- Burner pressure P_{Br} 0,5 - 100 mbar

Mounting instruction - impulse lines P_L , P_F and P_{Br}

- Impulse lines should preferably be made of steel. Inside diameter $> \phi 4$ mm (steel tube $\phi 6/4$).
- For P_L other material can be used.
- Impulse lines P_L and P_{Br} are ready from factory.
- Impulse lines shall be mounted in such a way that no condensate can flow back into the multibloc. This is especially important when P_F is concerned.
- Impulse lines shall be mounted in such a way that they are protected against rupture and damage.
- Impulse lines shall be as short as possible.

Adjustment range



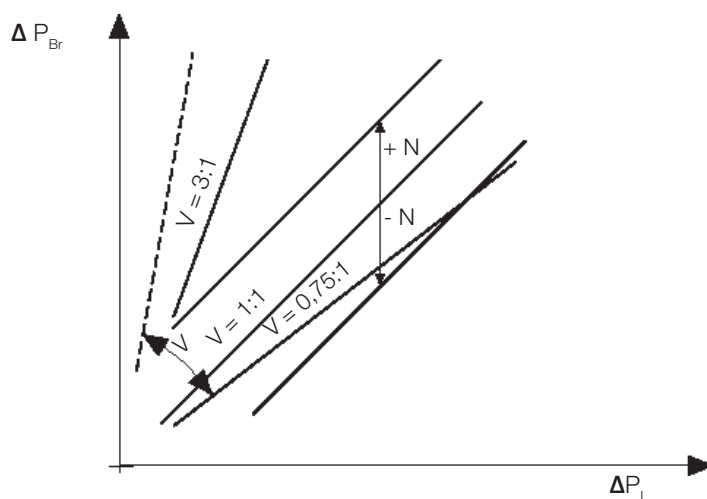
Effective burner pressure

$$\Delta P_{Br} = P_{Br} - P_F$$

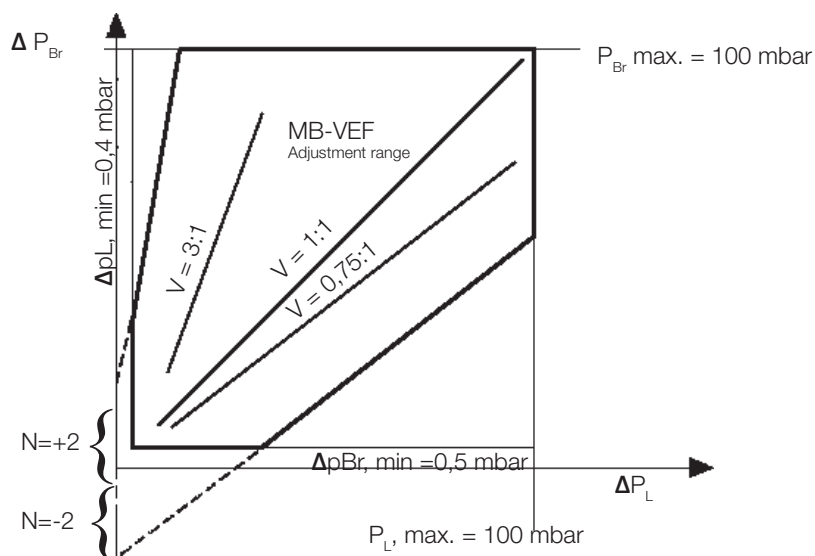


Effective fan pressure

$$\Delta P_L = P_L - P_F$$



Adjustment range



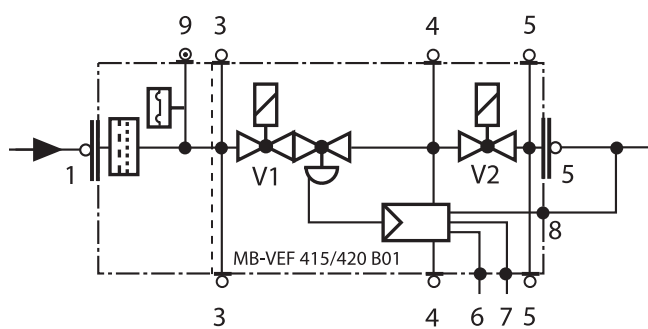
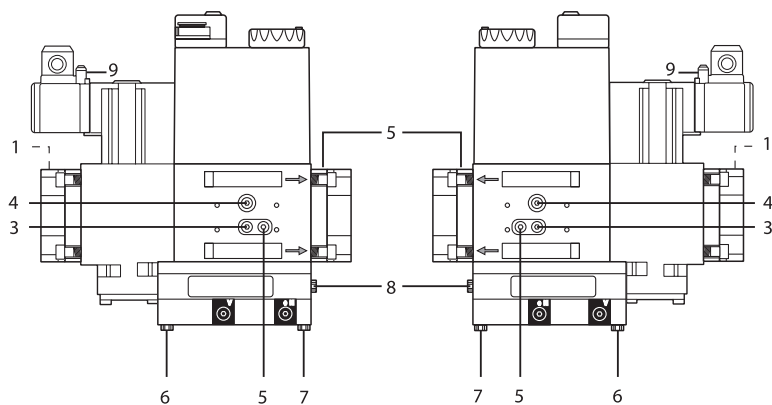
5.10.1 Pressure taps

MB-VEF 415
MB-VEF 420

1, 2, 3, 4, 5 G1/8 screwed seal plug

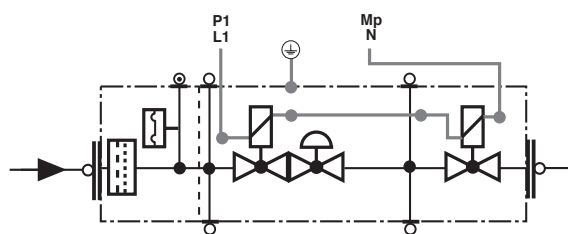
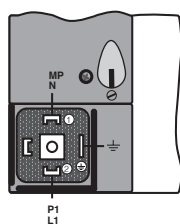
9 Test nipple

6, 7, 8 Pulse lines P_L , P_F and P_{Br} .



5.10.2 Electrical connection

S 10/S 30



6. Service

Whoever carries out service and maintenance on the burner must be authorised to do so. If components need to be replaced, the replacements must be of the same make and type and be approved by the authorities. If the burner is to be used for a different grade of gas, a new adjustment must be carried out. If town gas is to be used, it is also necessary to convert the combustion assembly; in some cases the multi-block or valves and gas train may also need to be changed to a larger type.

6.1 Servicing the combustion assembly

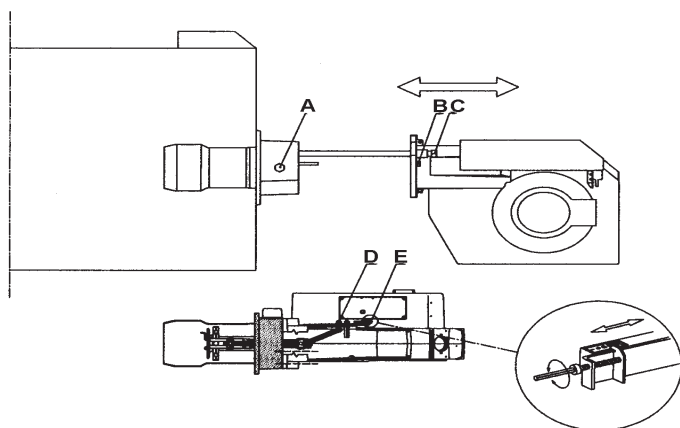
Removal and installation

1. Switch off the main power supply and disconnect the Euro plugs from the burner.



If the burner is directly connected, ensure that all components on the burner are without power.

2. Remove the cover and disconnect the ignition cable, ionisation cable and control arm from the gas nozzle.
3. Loosen the nuts (B) and pull the burner body out of the guides.
4. Loosen the screw (A); this releases the combustion assembly and allows it to be lifted out.
5. Check and clean the brake plate and gas inlet. If necessary, replace the worn parts.
6. Check the ignition electrode (see chapter Gas nozzle). Replace if necessary.
7. Check the ionisation electrode (see chapter Gas nozzle). Replace if necessary.
8. Fit the combustion assembly in reverse order.
9. Press the burner together and lock using the nuts (B).
10. Fit the Euro plugs and turn on the main power supply.
11. Check/adjust the combustion.



6.2 Servicing air dampers

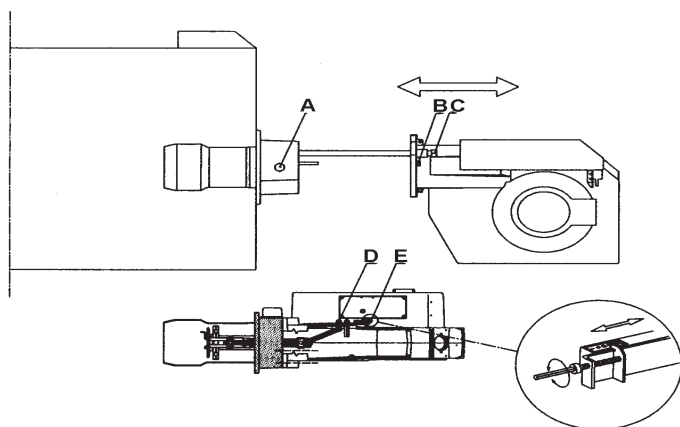
Removal and installation

1. Switch off the main power supply and disconnect the Euro plugs from the burner.



If the burner is directly connected, ensure that all components on the burner are without power.

2. Loosen the nuts (B) and pull the burner body out of the guides.
3. Remove the intake grille at the air intake.
4. Remove the screws (G) securing the damper motor mounting plate.
5. Lift up the damper motor.
6. Clean the air damper (F) and the intake. Lubricate any damper shaft.
7. Re-install the damper motor and mounting plate on the air intake. Ensure that the damper shaft and control arm are connected correctly.
8. Adjust the home position of the damper before tightening the screws (I).
9. Push the damper motor forwards and backwards in the adjustment slot.
10. Lock the damper motor in position where the damper is almost engaged but still has a small air gap by the fan housing.
11. Install the intake grille for the air intake.
12. Press the burner together and lock using the nuts (B).
13. Check/adjust the combustion.



6.3 Replacement of damper motor, air

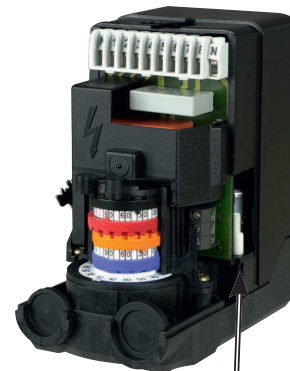
Removal and installation

1. Break the main current and disconnect the Euro plugs from the burner.



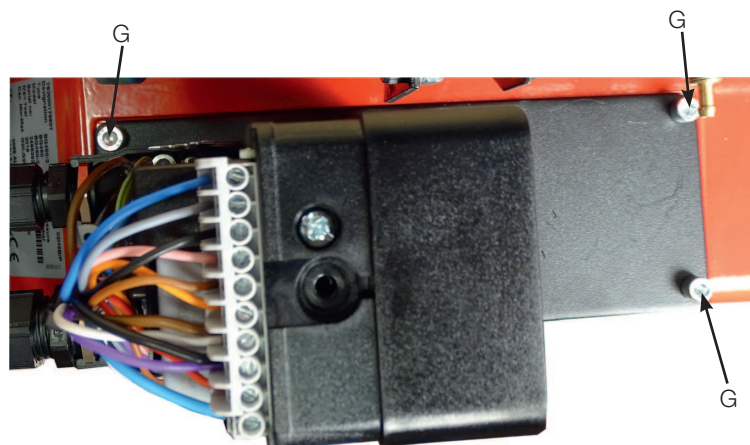
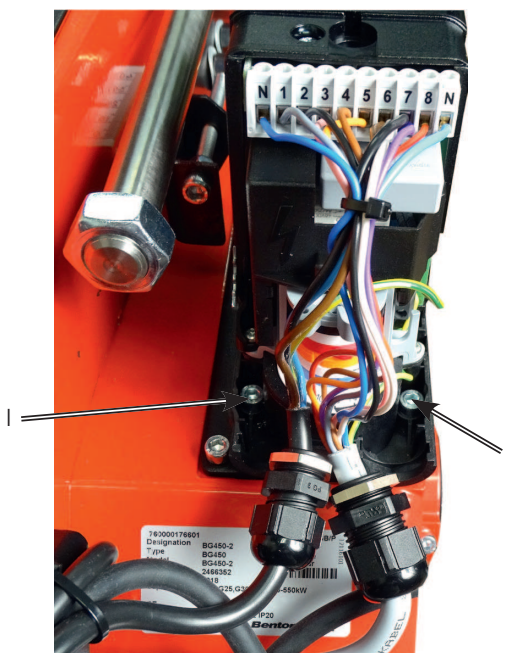
If the burner is directly connected, ensure that all components on the burner are without power.

2. Note the connection position of the cables on the damper motor.
3. Disconnect the damper motor cable from the damper motor.
4. Loosen the screws (G) to the damper motor mounting plate.
5. Lift up the damper motor.
6. Remove (H) the control arm from the motor shaft.
7. Remove the screws (I) securing the damper motor to the mounting plate.
8. Remove the damper motor from the mounting plate (I).
9. Install the new damper motor on the mounting plate.
10. Fit the control arm on the damper motor shaft. It is important that the screw is perpendicular to the plane of the shaft.
11. Re-install the damper motor and mounting plate on the air intake. Ensure that the damper shaft and control arm are connected correctly.
12. Connect the damper motor cable.
13. Fit the Euro plugs and turn on the mains power.
14. Check/adjust the combustion.



- Releasing button

By pressing the button and snapping it down, the motor will be released and the damper can easily be turned. This function facilitates an exchange of damper motor.



6.4 Flame monitoring and ionisation current check

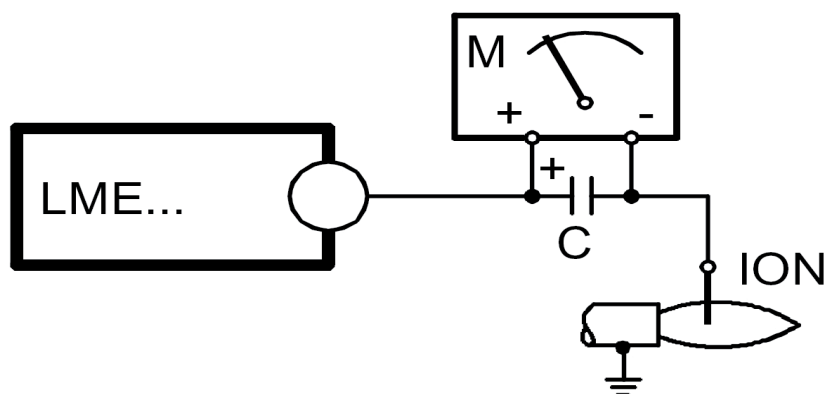
The standard version of the burner is monitored according to the ionisation principle. The ionisation current should be checked on initial start-up and at each service visit.

The reason for low ionisation current can be leakage current, poor connection to earth, fouling or incorrectly positioned ionisation electrode in the combustion head. Occasionally, an incorrect gas/air mix may result in poor ionisation current. Ionisation current is measured using a microammeter (μA) connected in series with the ionisation electrode and gas burner control. Connect the μ ammeter according to the diagram. The minimum required ionisation current is shown in the table. In practice, this current must be significantly higher, preferably more than $10\text{ }\mu\text{A}$. Connection of the μA instrument is made easier by the fact that all gas burners are equipped with a divisible ionisation cable.

Technical data

For continuous operation!

Idle voltage at ION-terminals	AC 115-230 V
<div style="background-color: #f0f0f0; padding: 10px; border: 1px solid #ccc;"> <div style="display: flex; align-items: center;"> <div style="font-size: 2em; margin-right: 10px;">!</div> <div>Protect the ionisation electrode from electric shock!</div> </div> </div>	
Short-circuit current	Max. AC 100-300 mA
Min. current for flame detection	Min. DC $1.5\text{ }\mu\text{A}$
Required current to ensure detection	Min. DC $3\text{ }\mu\text{A}$
Possible detection current	Max. DC $20\text{ }\mu\text{A}$
Operational indicator lamp flashes green	$<5\text{ }\mu\text{A DC}$
Operational indicator lamp shines green	$>5\text{ }\mu\text{A DC}$



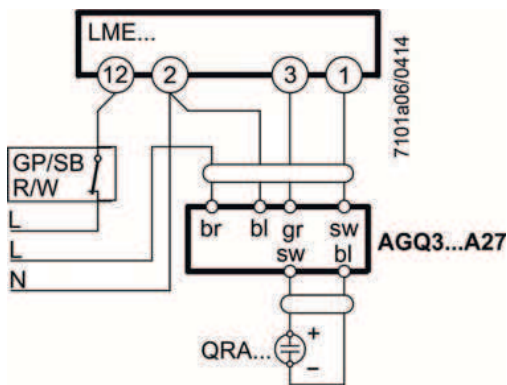
6.5 UV-Detector

DC current detector signals with flame detector QRQ...	Min. required	Max. possible
Measurement at the flame detector QRA...	200 μ A	500 μ A

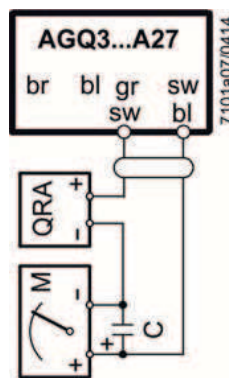
Ancillary unit AGQ3...A27

In connection with burner controls LMExx.xxxx2, use of UV ancillary unit AGQ3...A27 is mandatory. Correct functioning of aged UV cells can be checked as UV test with a higher supply voltage across the UV cell after controlled shutdown until terminal 3 ON.

Connection diagram



Measuring circuit for measuring the UV flame current



Measurement made at the flame detector QRA...

6.6 Vibration

Maximum vibration level are 5,0 mm/s

- Check all bolts and nuts for correct torque
- Check fan wheel for damage and contamination. Change when dirty/unbalanced
- Check motor bearings. If worn change motor/bearings



7. Handing over of the installation

- Make repeated start attempts to ensure that the adjustments function.
- Close the ball valve during operation to check that the gas switch switches off at the set value.
- Remove the hose for the air pressure switch to check that the burner locks out.
- Check that all protective covers and measurement nipples are mounted and fastened.
- Fill out necessary test reports.
- Instruct the persons in charge of the operation on the service and maintenance of the installation and what to do should any troubles occur.
- Inspection and service must be carried out by authorized personnel.



Review and service should be performed by authorised personnel only

8. Fault location, functional troubles

Trouble free operation is dependent on three factors: electricity, gas and air supply. Should there be any changes in the ratio between these three factors there is a risk of break downs. It has been proved that most break downs are caused by simple faults. Before calling the service engineer, the following should therefore be checked:

- Is the gas cock open?
- Are all fuses in order and the current switched on?
- Are the thermostats correctly set?
- Are pressostats, overheating protection etc. in operating position and not locked-out?
- Is the gas pressure sufficient?
- Is the gas burner control in start position?
- Has the gas control or the motor protector locked out? - Reset.
- Is the circulation pump in operation?
- Is there a supply of fresh air to the installation?
- If integral components are of a different make from what is stated in this manual, see the enclosed loose-leaf.

9. Electric equipment

9.1 Safety system

Safety systems must be installed in accordance with regulations that are applicable for the appliance. This may differ according to the process burner are installed in to. Se local regulations for information.

Safety system cables must be run in separate cables outgoing signal must not come in same cable as incoming signal. Signals must be in different harnesses for safety reasons.

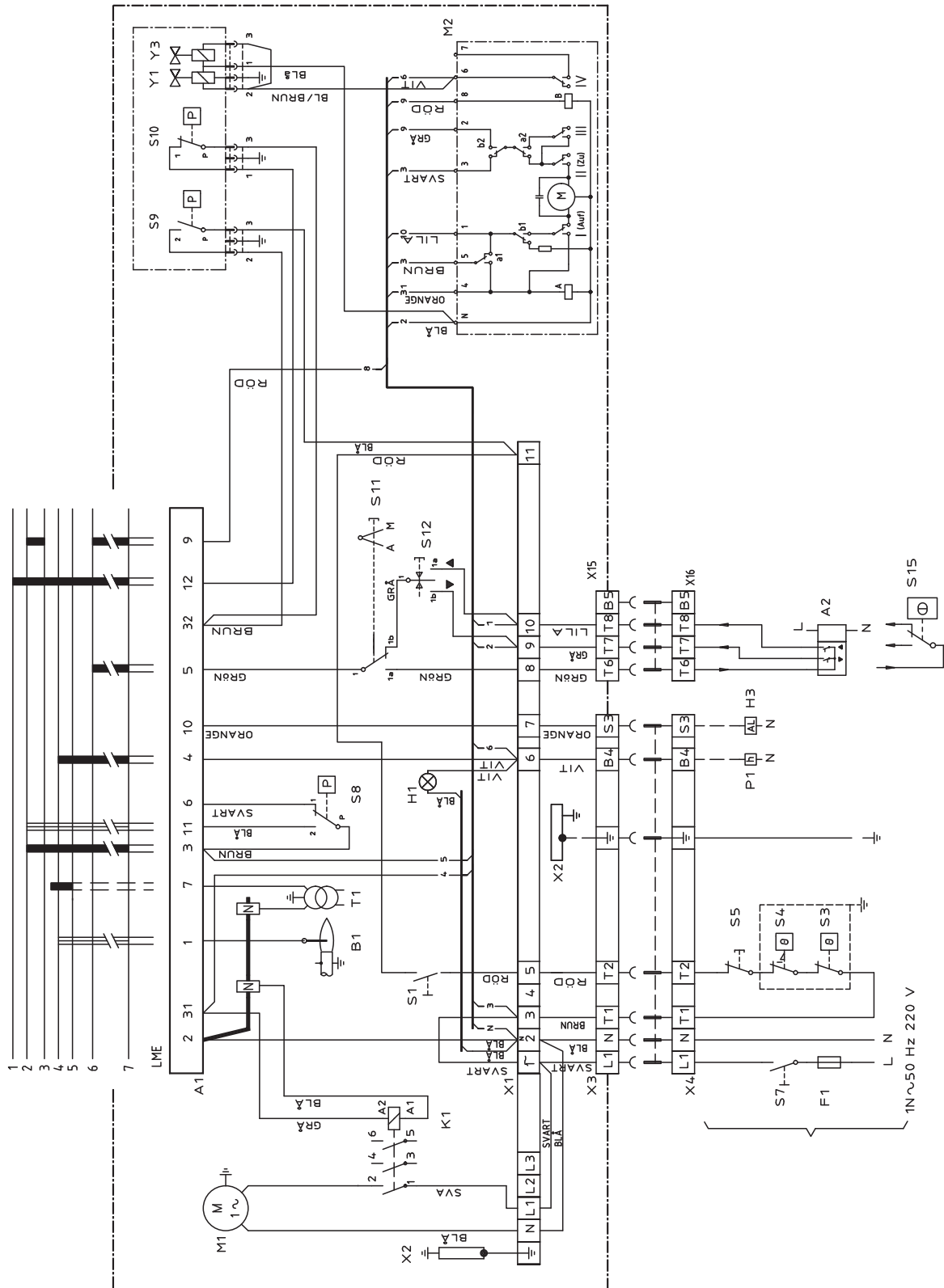
Safety system as door switches, water level, pressure, temperature and other safety limiters must be installed in safety loop according to process.

The switch for high gas pressure can be installed for different uses. Installation must be carried out pursuant to applicable regulations.

- The switch can be installed so that it reacts either to inlet pressure or pressure according to the multi-block pressure regulator.
- The high gas pressure switch can be installed to the connection pipe between the multi-block and the burner head, and will then function as a power monitor.
- Installation will block burner operation and a manual restart will be required.

Installation must be carried out pursuant to applicable regulations.

9.2 Wiring diagram LME



9.3 List of components

A1	Burner control	S3	Control thermostat	T1	Ignition transformer
A2	Power control	S4	Temperature limiter	X1	Connection terminal board
B1	Ionization electrode	S5	Micro switch for hinged door	X2	Earth terminal
F1	Operating fuse	S7	Main switch	X3	Plug-in contact, burner
H1	Operating lamp	S8	Air pressure switch	X4	Plug-in contact, boiler
H3	Alarm signal 230 V	S10	Gas pressure switch, max/ lockout funktion	X15	Plug-in contact, power controller, burner
K1	Kontaktor	S11	Change-over switch, Aut.- Man.	X16	Plug-in contact, power controller
M1	Burner motor	S12	Omkopplare, Öka-Minska	S9	Gas pressure switch
M2	Damper Motor	S15	Change-over switch, Increase-Decrease	Y1	Solenoid valve 1
P1	Time meter, total operating time			Y3	Solenoid valve 3
S1	Operating switch				

9.3.1 Function LME...

1. Operating switch ON-Thermostat ON-Gas pressure switch ON A check that the air pressure switch does not indicate fan pressure is carried out
2. Burner motor starts A check that the air pressure switch indicates sufficient fan pressure is carried out
3. The ignition spark is created
4. The gas solenoid valve is open The gas is ignited. The ionisation electrode now indicates a flame
5. The safety time expires The ignition spark ceases. The safety period ceases. If the spark is missing or it disappears after this time limit, the gas burner control is blocked
6. Operating position
7. Stop The operation of the burner can now be stopped with the control switch or thermostat
If the gas burner control is blocked Red light in the gas burner control is lit. The burner is restarted by pushing the reset button

9.4 Control program at faults; fault mode indicator LME

9.4.1 Colour codes

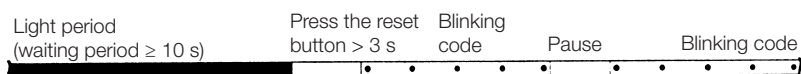
Table colour codes for multi-coloured signal light (LED)		
Status	Colour codes	Colours
Waiting period «tw», other waiting periods	○.....	Off
Ignition phase, ignition controlled	•○ •○ •○ •○ •○ •	Blinking yellow
Normal operation	□.....	Green
Operation, poor flame signal	□○□○□○□○□○	Blinking green
Illegal flame signal during start-up	□▲□▲□▲□▲□▲	Green-Red
Undervoltage	●▲●▲●▲●▲●▲	Yellow-Red
Fault, alarm	▲.....	Red
Blinking code for fault codes	▲○ ▲○ ▲○ ▲○	Blinking red
Interface diagnostics	▲▲▲▲▲▲▲▲	Red flicking

.....	Continuous
○	Off
▲	Red
●	Yellow
□	Green

9.4.1.1 Diagnosing alarm causes

After alarm disconnection, the red alarm signal light is lit continuously.

The diagnosing of the alarm cause can be read according to the following sequence:



9.4.1.2 Limiting of starting repetitions

LME 11... has a function with start repetition if the flame is not created at start or disappears during operation.. LME 11... allows max. three repetitions during continuous starting cycle.

9.4.1.3 Alarm code table

Red blinking code on signal lamp (LED)	Possible causes
Blinking 2 x ..	No flame creation at End of "TSA" - defective or fouled flame monitoring - defective or fouled fuel valves - poor burner setting - defective firing device
Blinking 3 x ...	"LP" defective - No air pressure switch signal after "t10" - "LP" is welded in open position
Blinking 4 x	Illegal flame signal during start-up
Blinking 5 x	Time out "LP" - "LP" is welded in open position
Blinking 6 x	Free
Blinking 7 x	Too many flame disappearances during operation - poor burner setting - defective or fouled fuel valves - defective or fouled flame monitoring
Blinking 8 x	Free
Blinking 9 x	Free
Blinking 10 x	Connection fault or internal fault, outgoing contacts or other faults
Blinking 14 x	CPI contact not closed

During the diagnosing of the alarm cause, the control outputs are voltage-free.

- The burner is disconnected
- Exception, alarm signal «AL» at board 10
- Reconnection of the burner happens after resetting only.
- Press the reset button 0.5...3 s

9.4.1.4 Interface diagnostics

To change to interface mode, press and hold the reset button longer than 3 s. To go back to the normal position, press and hold the reset button longer than 3 s. If the gas burner control is in the alarm position, it is reset by pressing the reset button 0.5...3 s.

10. FAULT LOCATION GUIDE

10.1 Gas Burner

A system's prerequisites for trouble-free operation can be secured only by the tuned interaction of the three factors, electricity, gas flow and air supply. Should any one of these factors change, this can cause a breakdown. It has been shown that most breakdowns are caused by rather uncomplicated things.

Before asking for service you should therefore make sure of the following:

1. Are the gas taps to the system open?
2. Are the fuses OK and the current switched on?
3. Are the controls (room thermostat, boiler thermostat, etc.) correctly set?
4. Is the gas pressure sufficient all the way to the burner?
5. Is the gas burner control ready to start and not in blocking mode?
6. Is correct air supply to the burner provided?

To facilitate the troubleshooting we have provided a table of the most common faults that can arise on a gas burner system and how they are corrected.

Cause	Corrective Action
The burner does not start	
No gas	Check that all gas taps are open, check the supply gas pressure.
No voltage	Check the fuse, thermostat and electrical connections.
The burner motor does not start	Motor defective
Gas burner control defective	Replace
The burner motor works, no ignition spark is created after the end of the pre-ventilation period	
No voltage on the terminal clamps	Check the contact. Replace defective gas burner control.
Ignition electrodes in contact with each other or with earth.	Adjust
Porcelain on ignition electrodes broken.	Replace the ignition electrode(s)
Cable terminals have poor contact	Improve the contact
Ignition cables damaged	Replace
Ignition transformer damaged, no voltage on the secondary side.	Replace the ignition transformer
Ignition cable and ionisation cable mixed up.	Switch

Cause	Corrective Action
No flame creation in spite of faultless start	
Gas solenoid valve defective	Replace
The gas solenoid valve does not open in spite of receiving voltage.	Replace the solenoid valve coil, possibly the entire valve.
No voltage to the solenoid valve	Check the contact
No electric connection through the air pressure switch.	Check the setting and function of the air pressure switch.
Start load not correctly set	Adjust the gas supply to correct quantity. Adjust the air quantity to correct combustion.
Gas burner control defective	Replace
Air pressure switch maladjusted or defective.	Check the setting and readjust it.
No acknowledge signal because the control motor cams are not correctly adjusted or have been displaced.	Readjust the control motor. If defective, replace.
The burner locks out after the end of the safety period, although a flame is created	
No ionisation current or the UV-detector in wrong position.	Adjust the ionisation electrode and the UV-detector. Check cables and connections .
Monitoring part in the gas burner control defective.	Replace the gas burner control
Voltage lower than 185 V	Contact electricity supplier
The ignition electrodes interfere with the ionisation current.	Adjust the ignition electrodes. If needed, repolarize the ignition transformer.
Poor earth connection	Provide for proper earth contact
Phase and neutral mixed up	Refer to the wiring diagram and change.
The burner locks out during pre-purge	
The air switch defective or maladjusted.	Adjust. Replace
Starting load not correctly set	Reduce or increase the gas supply. Reduce the air quantity.
Gas pressure too low	Increase the pressure. Contact the gas supplier.
Condensation formation in the boiler and in the chimney	
Flue-gas temperature too low or gas quantity too small.	Increase the flue-gas temperature by increasing the gas quantity. Insulate the stack.

Cause	Corrective Action
Pulsations at start	
Ignition electrodes maladjusted	Readjust.
Gas pressure too high	Check and adjust with a pressure gauge and pressure regulating valve.
Flue-gas side blocked	Check the stack flue
Incorrectly adjusted burner	Adjust the burner
The burner pulsates during operation	
The burner is maladjusted	Readjust
The burner is dirty	Clean the burner.
Incorrect chimney	Check and possibly change the dimension.
The burner works correctly but sometimes it goes into blockage	
The ionisation current too weak	Check. Should be at least 5 μ A according to the gas burner control manufacturer, but ought to be at 15-25 μ A.
The UV-detector in wrong position	Adjust
Voltage drop at certain periods	Must not drop more than 15% of the rated voltage.
Incorrect setting or defective air switch.	Adjust the air switch. If defective, replace
Spar-oven in the ignition electrodes.	Replace
The gas burner control ambient temperature is too high.	Insulate for heat, max. 60°
Ignition spark too weak	Check the ignition transformer

Cause	Corrective Action
Poor combustion	
Poor draught conditions	Check the stack
Flue-gas temperature too high	The boiler is too loaded. Decrease the gas quantity. Adjust correct burner power.
CO ₂ amount too low	Throttle the air. Check the boiler for leakage. Throttle the draught if it is too high.
CO-content too high	
Air surplus at natural gas and gasol (propane, butane).	Throttle the air
Air deficit	Open for the air. Check the stack damper.
Holes in the gas nozzle blocked by dirt.	Clean
Fresh air intake too poor	Check and make it bigger
Crooked flame caused by an out of position combustion head.	Check the combustion head and readjust it.

EU Declaration of conformity

Bentone Gasburners



Certificate No.	Type	Certificate No.	Type
CE-0123CT1269	BFG 1	CE-0123CT1326	BG 550
CE-0123CT1281	STG 146	CE-0123CT1348	BG 650
CE-0123CT1292	BG 300	CE-0123CT1359	BG 700
CE-0123CT1304	BG 400	CE-0123CT1360	BG 800
CE-0123CT1315	BG 450	CE-0123CT1371	BG 950

This declaration of conformity is issued under the sole responsibility of the manufacturer. The object of the declaration described above is in conformity with:

Gas Appliance Regulation 2016/426/EU

Machinery Directive 2006/42/EC

EMC 2014/30/EU

Restriction of the use of certain hazardous substances (RoHS) Directive 2011/65/EU

References to the relevant harmonised standards used or references to the other technical specifications in relation to which conformity is declared:

EN 676+A2:2008 (Fulfills the requirements of Annex J/K) Automatic forced draught burners for gaseous fuels

Additional information can be downloaded at:
www.bentone.com

Enertech AB
Box 309
S-341 26 LJUNGBY

Ljungby February 15th, 2018

Håkan Lennartsson
Managing Director
Enertech AB



General instructions for gasburners

Installation

1. Follow standards and instructions applicable to the installation of gas burners
2. Ensure that the electric installation is made in accordance with existing regulations
3. Check that the fresh air intake of the boiler room is sufficiently dimensioned
4. Check by studying the data plate that the efficiency of the burner is adapted to the boiler output
5. Check that the burner is adapted to the gas quality in question
6. Check that the input pressure of the gas is correct
7. Check that the dampers of the boiler are open
8. Check that there is water in the system
9. Check that thermostats etc. are correctly adjusted
10. Read the instructions and follow the directions given for the burner as to starting-up and service

Maintenance

General instructions

1. Keep the boiler room clean
2. Ensure that the fresh air intake of the boiler room is not restricted
3. Switch off the current and shut off the gas supply if the burner must be withdrawn from the boiler
4. Do not use the boiler for burning paper and waste if there is no special arrangement (fire room) for this

If the burner has stopped

1. Press the reset button of the relay
2. Check that the max. thermostat has not cut out
3. Check other thermostats for example room thermostat, if any
4. Check that the gas pressure to the burner is sufficient
5. Check that the electric fuses have not blown
6. Make a new attempt to start the burner and check the counter of the gas meter to find out whether the solenoid valve opens
7. If the burner does not start in spite of repeated starting attempts call the installer

Normal operation

1. Ensure that the air supply to the burner is not obstructed by dust and dirt
2. Have the installer make a yearly overhaul of the installation so that safety is not jeopardized
3. Have the installer at the yearly overhaul also adjust the burner to ensure optimal combustion economy
4. Check periodically that there is water in the system (fill up if necessary) and that thermostats etc. are normally adjusted
5. Ensure that there is no water or dampness in contact with the burner

Shut-Off

1. Switch off the current with the main switch
2. Shut-off the gas supply with the shut-off cock on the burner

Warning

1. Never keep your face in front of the fire room door when starting up the burner
2. Do not use naked flame when inspecting the fire room

Authorized installer:

Address: _____

Tel: _____

Installation	Boiler	
Name:	Type:	Efficiency kW:
Address:		
	Burner	
	Type:	Efficiency kW:
Installed by:	Date:	

Date										
	Nm ³ gas/h	Governor		O ₂	CO	Flue gas temp	Ionisation current	Pressure		Efficiency
								Fire room	Chimney	
Measurement		Before	After	%	ppm	°C	μ A	mbar		mbar %
	Small flame									
	Large flame									
Measures										

Date										
	Nm³ gas/h	Governor		O ₂	CO	Flue gas temp	Ionisation current	Pressure		Efficiency
								Fire room	Chimney	
Measurement		Before	After	%	ppm	°C	μ A	mbar		mbar %
	Small flame									
	Large flame									
Measures										

Date										
	Nm ³ gas/h	Governor		O ₂	CO	Flue gas temp	Ionisation current	Pressure		Efficiency
								Fire room	Chimney	
Measurement		Before	After	%	ppm	°C	μ A	mbar		mbar %
	Small flame									
	Large flame									
Measures										

